CLAIMS

What is claimed is:

1. A ceramic matrix composite turbine engine component, the component having a direction of maximum tensile stress during normal engine operation, comprising:

   a plurality of biased ceramic plies, each biased ply comprising ceramic fiber tows, the tows woven in a first warp direction and a second weft direction, the second weft direction lying at a preselected angular orientation with respect to the first warp direction, wherein a greater number of tows are woven in the first warp direction than in the second weft direction, and wherein a number of tows in the second weft direction allows the biased plies to maintain their structural integrity when handled;

   the plurality of biased plies laid up in a preselected arrangement to form the component, wherein a preselected number of the plurality of biased plies are oriented such that the orientation of the first warp direction of the preselected number of biased plies lie about in the direction of maximum tensile stress during normal engine operation;

   a coating applied to the plurality of biased plies, the coating selected from the group consisting of BN, SiC, and combinations thereof; and

   a ceramic matrix material lying in interstitial regions between the tows of each biased ply and the interstitial region between the biased plies.

2. The ceramic matrix composite turbine engine component of claim 1, wherein the ceramic matrix material is silicon carbide.

3. The ceramic matrix composite turbine engine component of claim 1, wherein a ratio of a number of tows in the first warp direction to the number of tows in the second weft direction in each of the biased ceramic plies is at least about 2:1.

4. The turbine engine component of claim 2, wherein the component is a turbine blade.

5. The turbine engine component of claim 2, wherein the component is a cooled turbine nozzle.

6. The turbine engine component of claim 2, wherein the component is an uncooled turbine nozzle

7. The ceramic matrix composite turbine engine component of claim 6, wherein a ratio of a number of tows in the first warp direction to the number of tows in the second weft direction in each of the biased ceramic fiber plies is at least about 2:1.

8. A ceramic matrix composite turbine engine component, the component having a direction of maximum tensile stress during normal engine operation, comprising:

    a plurality of ceramic plies, each ply comprising ceramic fiber tows, the tows in each ply lying adjacent to one another in a planar arrangement such that each ply has a unidirectional orientation;

    a coating applied to the plies, the coating selected from the group consisting of BN, Si_3N_4, and combinations thereof;

    the plurality of plies laid up in a preselected arrangement to form the component, wherein a preselected number of the plurality of plies are oriented such that the orientation of the preselected number of the plurality of plies lie in the direction of maximum tensile stress during normal engine operation; and

    a ceramic matrix material lying in interstitial regions between the tows of each ply and the interstitial region between the plurality of plies.

9. The ceramic matrix composite turbine engine component of claim 8, wherein the ceramic matrix material is silicon carbide.

10. The turbine engine component of claim 9, wherein the component is a turbine blade.

11. The turbine engine component of claim 9, wherein the component is a cooled turbine nozzle.

12. The turbine engine component of claim 9, wherein the component is an uncooled turbine nozzle

13. A method of manufacturing a turbine engine component, the component having a direction of maximum tensile stress during normal engine operation, comprising the steps of:

    providing a plurality of biased ceramic plies, each biased ply comprising ceramic fiber tows, the tows woven in a first warp direction and a second weft direction, the second weft direction lying at a preselected angular orientation with respect to the first warp direction, wherein a greater number of tows are woven in the first warp direction than in the second weft direction, and wherein a number of tows in the second weft direction allows the biased plies to maintain their structural integrity when handled;

    laying up the plurality of biased plies in a preselected arrangement to form a component shape, wherein a preselected number of the plurality of biased plies are oriented such that the orientation of the first warp direction of a preselected number of the plurality of biased plies lie about in the direction of maximum tensile stress during normal engine operation;

    rigidizing the component shape with a layer of BN and a layer of SiC to form a coated component preform using chemical vapor infiltration;

    partially densifying the coated component preform using carbon-containing slurry; and

    further densifying the coated component preform with at least silicon to form a ceramic matrix composite aircraft engine component with biased architecture.

14. The method of claim 13, wherein a ratio of a number of tows in the first warp direction to the number of tows in the second weft direction is at least about 2:1.

15. The method of claim 13, wherein the plies are silicon carbide containing plies.

16. The method of claim 14, wherein the turbine engine component is a turbine blade.

17. The method of claim 14, wherein the turbine engine component is a cooled turbine nozzle.

18. The method of claim 14, wherein the turbine engine component is an uncooled turbine nozzle.

19. A method of manufacturing a ceramic matrix composite aircraft engine component, the component having a direction of maximum tensile stress during normal engine operation, comprising the steps of:

    providing a plurality of prepreg ceramic plies, the plies comprising prepreg ceramic fiber tows, the tows in each ply lying adjacent to one another in a planar arrangement such that each ply has a unidirectional orientation;

    laying up the plurality of prepreg ceramic cloth plies in a preselected arrangement to form a component shape such that a preselected number of outermost plies are oriented at about 0° with respect to the direction of maximum tensile stress of the turbine engine component during normal engine operation;

    heating the turbine blade shape to form a ceramic preform; and

    densifying the turbine blade preform with at least silicon to form a ceramic matrix composite turbine blade.

20. The method of claim 19, wherein the turbine engine component is a turbine blade.